

# Forging Machines

WAC 296-806-430

## Summary

- If your specific machine or operation isn't listed here, then follow any general requirements in this section along with the "Requirements for All Machines" found in this chapter, WAC 296-806-200 and WAC 296-806-300.

The requirements in this section apply to machines used in the forming of hot metal, such as hot trimming presses, forging hammers, hot forging presses, upsetters, hot bending and hot metal presses, and equipment used in boltheaded and rivet making, as well as other forging equipment. For specific forging machine requirements, see Table 430-1.



### Exemption:

- This section doesn't apply to cold forging operations.

## YOUR RESPONSIBILITY:

**To make sure all forging and associated equipment in your workplace are constructed, operated, and maintained in a safe manner**

### You must

#### GENERAL REQUIREMENTS FOR FORGING MACHINES

Follow these safety requirements when using lead and lead casts WAC 296-806-43002 .....	430-4
Properly inspect and maintain forging equipment WAC 296-806-43004 .....	430-5
Use safety blocks on hammers and presses WAC 296-806-43006 .....	430-5
Make sure tongs meet these requirements WAC 296-806-43008 .....	430-7

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# Forging Machines

WAC 296-806-430

## Summary

Protect employees when removing scale WAC 296-806-43010 .....	430-8
Provide adequate foundations for hammers and presses WAC 296-806-43012 .....	430-8
Follow these requirements for manually operated valves and switches WAC 296-806-43014 .....	430-9

### HAMMERS

Use die keys and shims made of proper-grade metal WAC 296-806-43016 .....	430-10
Provide a safety cylinder head WAC 296-806-43018 .....	430-10
Provide a shutoff valve WAC 296-806-43020 .....	430-11
Provide a means for cylinder draining WAC 296-806-43022 .....	430-11
Follow these requirements for pressure pipes WAC 296-806-43024 .....	430-12
Follow these requirements when using board hammers WAC 296-806-43026 .....	430-12

### OTHER FORGE FACILITY EQUIPMENT

Protect against sparks from saws WAC 296-806-43028 .....	430-13
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# Forging Machines

WAC 296-806-430

## Rule

**Table 430-1**  
**Specific Requirements for Forging Machines**

	Steam Hammers	Airlift Hammers	Board Hammers	Saws
<b>WACs needed in addition to those included under “General Requirements for Forging Machines”</b>				
WAC 296-806-43016 Use die keys and shims made of proper-grade material	X	X		
WAC 296-806-43018 Provide a safety cylinder head	X	X		
WAC 296-806-43020 Provide a shutoff valve	X	X		
WAC 296-806-43022 Provide a means for cylinder draining	X	X		
WAC 296-806-43024 Follow these requirements for pressure pipes	X	X		
WAC 296-806-43026 Follow these requirements when using board hammers			X	
WAC 296-806-43028 Protect against sparks from saws				X



# Forging Machines

WAC 296-806-430

## Rule

### GENERAL REQUIREMENTS FOR FORGING

#### WAC 296-806-43002

**Follow these safety requirements when using lead and lead casts**

#### You must

- 1) Provide thermostats for heating elements to prevent overheating.
- 2) Provide a means of exhaust for fixed or permanent lead pot installations.
- 3) Provide a covered container to store dross skimmings.
- 4) Keep equipment clean, especially from accumulations of yellow lead oxide.



#### Reference:

- For requirements about Personal Protective Equipment (PPE), see the Safety and Health Core Rules, WAC 296-800-160.
- For ventilation requirements when using portable lead pot units, see the General Occupational Health Standards, Chapter 296-62 WAC.



# Forging Machines

WAC 296-806-430

## Rule

### WAC 296-806-43004

#### Properly inspect and maintain forging equipment

##### You must

- Keep all forge shop equipment in safe operating condition.
- Train personnel in proper inspection and maintenance procedures.
- Establish periodic and regular safety inspections.
- Schedule frequent and regular safety inspections of all guards and point of operation protection devices.
- Keep written records of safety inspections that include all of the following:
  - Date of the inspection
  - Signature of the person doing the inspection
  - Serial number or other identification for the piece of equipment inspected
- Safeguard all overhead machinery parts so they don't fly off or fall, if the equipment breaks.

### WAC 296-806-43006

#### Use safety blocks on hammers and presses

##### You must

- Use safety blocks on hammers and presses when dies are being changed and maintenance or repair work is being done on the machine.
- Provide safety blocks or wedges that meet or exceed the specifications and dimensions shown in Table 430-2.

-Continued-



# Forging Machines

WAC 296-806-430

## Rule

### WAC 296-806-43006 (Continued)

**Table 430-2**  
**Strength and Dimensions for Wood Safety Blocks or Wedges**

Size of timber inches using actual dimensions	4x4	6x6	8x8	10x10	12x12	
Square inches in cross section	16	36	64	100	144	
Minimum allowable crushing strength parallel to grain, p.s.i.	5,000	5,000	5,000	5,000	5,000	<b>Note:</b> Adapted from U.S. Department of Agriculture Technical Bulletin 479. Hardwoods recommended are those whose ultimate crushing strengths in compression parallel to grain are 5,000 p.s.i. (pounds per square inch) or greater.
Maximum static load within short column range	80,000	180,000	320,000	500,000	720,000	<b>Note:</b> Slenderness ratio formula for short columns is $L/d=11$ , where L=length of timber in inches and d=least dimension in inches; this ratio should not exceed 11.
Safety factor	10	10	10	10	10	
Maximum recommended weight of forging hammer for timber used	8,000	18,000	32,000	50,000	72,000	
Maximum allowable length of timber in inches	44	66	88	100	132	



# Forging Machines

WAC 296-806-430

## Rule

**WAC 296-806-43008**

### **Make sure tongs meet these requirements**

#### **You must**

- Make sure tongs used with hammers, presses, upsetters, and forging equipment used in boltheaded and rivet making, meet the following requirements:
  - They are long enough so the worker can use the tongs without standing behind them, in order to avoid injury, in case of kickback.
  - The handle ends aren't sharp.



#### **Note:**

- The worker should be instructed about proper body positions when using tongs.
- Tongs should be checked periodically to see that they remain at the proper hardness level for the job.
- Rings or equivalent devices that are used for locking tongs should be inspected periodically to make sure they are safe.



# Forging Machines

WAC 296-806-430

## Rule

WAC 296-806-43010

### Protect employees when removing scale

#### You must

- Protect employees at every hammer and press by:
  - Making sure they don't place a hand or arm between the dies by providing them with devices that reach the full length of the die when removing scale.
  - Examples include:
    - Oil swabs
    - Scale removers
    - Other devices that remove scale by reaching the full length of the die
    - Stopping flying scale through construction and arrangement of a scale guard that's of **substantial construction** at the back of every hammer and press.

WAC 296-806-43012

### Provide adequate foundations for hammers and presses

#### You must

- Provide foundations adequate to support the imposed weight and normal work stress for hammers and presses.
  - Hammers and presses must remain on their foundations.





# Forging Machines

WAC 296-806-430

## Rule

**WAC 296-806-43014**

**Follow these requirements for manually operated valves and switches**

### **You must**

- Make sure all manually operated valves and switches are clearly identified and readily accessible for all of the following:
  - Presses
  - Upsetters
  - Forging equipment involved in boltheading and rivet making



# Forging Machines

WAC 296-806-430

## Rule

### HAMMERS

#### WAC 296-806-43016

##### Use die keys and shims made of proper-grade material

##### You must

- Make sure that die keys and shims are made from a grade of material that won't easily crack or splinter



##### Note:

- Die keys and shims shouldn't project more than 2 inches in front and 4 inches in back of the ram or die.

#### WAC 296-806-43018

##### Provide a safety cylinder head

##### You must

- Make sure that every steam, airlift, or air hammer has a safety cylinder head that acts as a cushion if the rod breaks or pulls out of the ram.



# Forging Machines

WAC 296-806-430

## Rule

### WAC 296-806-43020

#### Provide a shutoff valve

##### You must

- Provide each steam and airlift hammer with a quick-closing emergency valve in the admission pipeline that's distinctly marked and in a convenient location.
  - This valve needs to be closed and locked in the "off" position when the hammer is being adjusted, repaired, or serviced, or the dies are being changed.



##### Reference:

- For requirements about Lockout/Tagout (Control of Hazardous Energy), see Chapter 296-803 WAC.

### WAC 296-806-43022

#### Provide a means for cylinder draining

##### You must

- Provide a means for draining cylinders on steam hammers.
- Provide airlift hammers with both main head and clamp cylinder drains.



# Forging Machines

WAC 296-806-430

## Rule

### WAC 296-806-43024

#### Follow these requirements for pressure pipes

##### You must

- Provide steam or air pressure piping on power-driven hammers that meets or exceeds the requirements in:
  - ANSI B31.1.0-1967, Power Piping, with addenda ANSI B31.1.06-1971, for hammers constructed before January 1, 2005.
  - ANSI B31.1.0-2001, Power Piping, with addenda ANSI B31.1.0A-2001, for hammers constructed on or after January 1, 2005.

### WAC 296-806-43026

#### Follow these requirements when using board hammers

##### You must

- Securely fasten a suitable enclosure to gravity-dropped board hammers to prevent damaged or detached boards from falling.
- Properly secure all major assemblies and fittings that can loosen and fall.



# Forging Machines

WAC 296-806-430

## Rule

### OTHER FORGE FACILITY EQUIPMENT

#### WAC 296-806-43028

#### Protect against sparks from saws

##### You must

- Provide all saws with a sheet metal guard that is positioned to stop sparks.
  - The guard must be constructed of at least  $\frac{1}{8}$  inch sheet metal.



##### Note:

- It's advisable to provide all saws with a means to trap sparks below the saw and to use a tank of water below the saw to reduce the fire hazard.



##### Reference:

- Other saw requirements may be found in Saws and cutting heads, WAC 296-806-480.

